

REMARKS

Claims 1, 3-5, 7-10, and 12-20 are currently pending in the present application.

Claim 1 has been amended to recite that the attenuation of the noticeability of the overlaps is done by making a total intensity of light radiated onto the overlaps equal or analogous to the intensity of light radiated onto layers other than the overlaps. Previously, there were three possibilities for obtaining the attenuation. Claim 1 was also amended for formalistic reasons to be in better form. Claim 1 now has the same scope as claim 11, which has been cancelled. Claim 5 was similarly amended. Also, in claim 5 the term “means” was changed to “device.” Claim 12 has been amended to be consistent with claim 1, and now recites that the method further comprises making a shape of the overlaps between the adjacent plotted areas in the optically-cured resin layer curved. The feature of making the shape of the overlaps curved was already in claim 12, so the difference is that the attenuation is done by making the curved overlaps in addition to the intensity control recited in claim 1. Claim 13 has been amended to be consistent with claim 1, and now recites that the method further comprises staggering positions of the overlaps in vertically-stacked optically-cured resin layers. The feature of staggering positions of the overlaps was already in claim 13, so the difference is that the attenuation is done by staggering positions of the overlaps in addition to the intensity control recited in claim 1. The features of claims 12 and 13 are supported at, for example, page 38, fourth full paragraph, of the specification as filed.

New claim 15 has been added, and it is based upon claim 1 (before the present amendment), but without the recitation of the attenuation of the noticeability of the overlaps being done by making a total intensity of light radiated onto the overlaps equal or analogous to the intensity of light radiated onto layers other than the overlaps. New claim 16 has been added, and it is based upon claim 5 (before the present amendment), but without the recitation of the attenuation of the noticeability of the overlaps being done by making a total intensity of light radiated onto the overlaps equal or analogous to the intensity of light radiated onto layers other than the overlaps. New claims 17-20 depend from claim 15 or claim 16, and recite the formation of curved overlap areas or staggering positions of the overlaps, as recited in claims 15 and 16.

The Office Action of March 29, 2010 includes an Interview Summary of an Interview which took place on February 2, 2010. The Interview Summary states that the “Examiner and Applicant seemed to agree that Kihara inherently taught an overlapping step which may provide a degree of attenuation of the overlaps.” The Applicant wishes to clarify the record in this regard. Specifically, the Applicant understands the Examiner’s position, however, this does not mean that the Applicant agrees with such position. Therefore, the Applicant has not and does not make any admission as to whether Kihara inherently teaches an overlapping step which may provide a degree of attenuation of overlaps. In fact, as explained below, it is the Applicant’s position that the Examiner has not appropriately shown that Kihara teaches an overlapping step.

Claims 1, 5, 8, 10, 12 and 14 are rejected under 35 U.S.C. §102(b) as being anticipated by Japanese Patent Application Publication No. JP 03-281329 (Kihara). Regarding claims 1 and 12, the Examiner alleges that Kihara discloses an optical three-dimensional shaping process for forming a three-dimensional object including exposing a photocurable resin to a light source through a planar exposure mask. The Examiner also alleges that Kihara teaches continuously changing the planar plotting mask, continuous motion of the planar plotting mask, overlapping of adjacent plotted areas in order to make the boundary areas unnoticeable, and using a computer to control the movement of the mask and XY controller in order to overlap adjacent areas, where the adjacent plotted areas can be in a curved state. The Examiner also alleges that Kihara discloses the features of claims 5, 8, 10, and 14. Applicant respectfully but strenuously traverses the rejection of claims 1, 5, 8, 10, 12, and 14 as anticipated by Kihara, for the reasons set forth below.

Claim 1 now requires making a total light intensity of light radiated onto the overlaps between the adjacent plotted areas in the optically-cured resin layer equal or analogous to the intensity of light radiated onto areas other than the overlaps. Kihara fails to disclose such feature. In fact, the Examiner acknowledges as much on page 11, lines 4-7 of the Office Action. Thus, claim 1 distinguishes over Kihara at least for this reason.

Also, although the Examiner cites to Figs. 2a-2f and page 8, lines 14-24 of Kihara (translation) that the build operation in Kihara consists of overlapping adjacent plotted areas in order to make the boundary areas unnoticeable, the Applicant disagrees. The Examiner has not identified any disclosure of overlaps, nor any disclosure of overlaps which are unnoticeable. The Examiner has not identified any disclosure in Kihara that the horizontal lines shown at Figs. 2c – 2e of Kihara are overlaps in irradiation, as opposed to merely boundaries between irradiated rows, and the disclosure at page 8, lines 14-24 of Kihara is similarly deficient in this regard.

Accordingly, claim 1 is patentable over Kihara. Claims 10 and 12 depend from claim 1 and are patentable at least for the same reasons as claim 1.

Also, claim 12 recites that the shape of the overlaps between adjacent plotted areas are curved. Although the Examiner alleges at the top of page 4 of the Office Action that Kihara discloses adjacent plotted areas can be in a curved state, and cites to Figs. 2a – 2c of Kihara, the Applicant respectfully disagrees that this meets the claimed feature of overlaps being curved. Just because the article in Kihara has a curved outer shape does not mean that overlaps (if any) between plot areas are curved. There is no disclosure in Kihara of curved overlaps. In fact, Kihara teaches otherwise. Figs. 2a – 2f of Kihara expressly show the shutter plate 3 moving linearly. Thus, any resulting boundary between plotted areas would also be linear unless there is teaching to the contrary. Kihara does not teach otherwise and therefore does not disclose curved overlaps.

Claim 5 similarly recites the formation of overlaps, and the making of total intensity of light radiated onto the overlaps equal or analogous to the intensity of light radiated onto areas other than the overlaps. Thus, claim 5 is patentable for the reasons discussed above regarding claim 1. Claims 8 and 14 depend from claim 5 and are patentable at least for the same reasons as claim 5.

In view of the above, reconsideration and withdrawal of the rejection of claims 1, 5, 8, 10, 12, and 14, as anticipated by Kihara, are respectfully solicited.

Claims 3-4 and 7 are rejected under 35 U.S.C. §103(a) as obvious over Kihara in view of U.S. Patent No. 6,500,378 (Smith), in further view of U.S. Patent No. 6,461,797 (Lercel). Claims 3-4 and 7 depend from claim 1 or claim 5, and therefore also include the feature of making the total intensity of light radiated onto the overlaps equal or analogous to the intensity of light radiated onto areas other than the overlaps. Smith and Lercel fail to disclose this feature. Thus, claims 3-4 and 7 are patentable over Kihara in view of Smith and Lercel. Accordingly, reconsideration and withdrawal of the rejection of claims 3-4 and 7 are respectfully solicited.

Claim 9 is rejected under 35 U.S.C. §103(a) as obvious over Kihara in view of U.S. Patent No. 3,718,396 (Hennings). Claim 9 depends from claim 5 and is patentable at least for the same reasons as claim 5, since Hennings does not cure the deficiencies discussed above regarding Kihara. Reconsideration and withdrawal of the rejection of claim 9 are respectfully solicited.

Claim 11 is rejected under 35 U.S.C. §103(a) as obvious over Kihara in view of U.S. Patent No. 6,085,122 (Manning). Claim 11 has been cancelled, making its rejection moot. However, claim 1 recites the features of claim 11, and will be discussed herein instead of claim 11. The Examiner acknowledges that Kihara does not teach performing an operation for making a total intensity of light radiated onto boundary areas among adjacent plotted areas in an optically-cured resin layer equal or analogous to the intensity of light radiated onto areas other than the boundary areas, and relies on Manning for this teaching. Applicant respectfully but strenuously traverses the rejection of claim 11 (to the extent it may be applied to claim 1), for the reasons set forth below.

Claim 1 recites that the mask images are utilized to make the total intensity of light radiated onto the overlaps equal or analogous to the intensity of light irradiated onto areas other than the overlaps. Thus, claim 1 recites that it is the mask images which are utilized to make the intensity equal or analogous in the overlaps and other areas. In contrast, Manning teaches that the light source itself is adjusted. Specifically, it is the laser disclosed in Manning which has an intensity which is varied, as opposed to a mask image. Manning fails to teach controlling a mask

in order to make the intensity of radiation equal or analogous in overlaps and other areas, and therefore cannot teach or make obvious such features, which are also missing in Kihara, as acknowledged by the Examiner.

Additionally, Manning recites the use of a laser, rather than a planar plot mask, as recited in the claimed invention and as disclosed in Kihara. Irradiation by a laser or by a planar plot mask are very different, since a planar plot results in a much broader area of radiation, and one of ordinary skill in the relevant art would not have referred to Manning for teachings regarding irradiation by a planar plot mask. Also, in methods involving laser irradiation, there is no distinctive difference between “overlaps” and other plotted areas, since laser irradiation is very local. Thus, all of the areas can be plotted areas. In fact, the Examiner has not identified overlapped areas in Manning, especially overlapped areas that are not uniformly radiated as compared to other areas, and for which greater uniformity is desired. Therefore, Manning does not teach and cannot make obvious the claimed invention. Accordingly, *prima facie* obviousness is lacking.

Moreover, Manning makes clear (see, e.g., Abstract), that laser power is controlled by scan velocity. Thus, the laser power is adjusted depending on the speed of movement of the laser over the substrate to be irradiated. The Examiner has not demonstrated in Kihara that the relative irradiation of overlaps (if any), as compared to other irradiated portions, is dependent on the speed of movement of the mask. Thus, even if the radiation intensity in Kihara were adjusted based upon the speed of movement of the mask, as taught by Manning, this would be irrelevant to the presence or absence of overlaps which have the same or analogous radiation intensity as other areas. The speed of movement of the mask is independent of making the intensity of overlaps and other areas the same or analogous. Moreover, at page 9, lines 3-5 of Kihara (see translation), it is disclosed that “it is possible to move the liquid crystal shutter plate 3 and the light source 4 at a constant speed without stopping during scanning.” Thus, Kihara explicitly discloses that the speed can be constant, so changing the intensity based on speed, as disclosed in Manning, would result in no change to the intensity of irradiation since the speed is constant.

Thus, the solution provided in Manning is not only unnecessary for the invention of Kihara, but also would not result in the claimed invention.

Furthermore, the Examiner alleges at pages 11-12 of the Office Action that Manning teaches that a constant energy flux is needed to eliminate defects such as ripples, and that it would have been obvious to make the laser flux density the same in Kihara to eliminate possible defects such as ridges. However, at page 7, lines 15-18 of Kihara (see translation), it is disclosed that an elevator stage 5 moves up and down to allow an appropriate amount of resin to be exposed to the radiation such that the full thickness can be cured with a single exposure time. Thus, the entire layer of resin above elevator stage 5 will be cured, and, therefore, the problem identified in Manning is absent. Specifically, there will be no differences in the depths of cure since the elevator stage 5 is utilized to provide a cure of the full layer. The elevator stage 5 is controlling the depth of cure of the resin to ensure full cure in a single exposure, and, therefore, varying the intensity of radiation would not cause cure depth variation since the elevator stage 5 is controlling the process such that the depth of cure is the same. Thus, the ripples disclosed in Manning would not occur in Kihara since the cured thickness would be the same. The solution disclosed by Manning is for a problem that Kihara expressly discloses is absent. Accordingly, there would have been no reason for one of ordinary skill in the art to utilize the system of Manning in Kihara to make the radiation of overlaps the same or equal as other areas, since the problem identified in Manning is nonexistent in Kihara.

In view of the above, *prima facie* obviousness has not been demonstrated, and claim 1 is patentable over Kihara in view of Manning. Notice to this effect is respectfully solicited.

Claim 13 is rejected under 35 U.S.C. §103(a) as being obvious over Kihara in view of U.S. Patent No. 6,264,873 (Gigl). The Examiner alleges that Kihara does not teach staggering positions of boundary areas among adjacent plotted areas in the optically-cured resin layer in vertically-stacked optically-cured resin layers, and relies on Gigl for this teaching. Applicant respectfully but strenuously traverses the rejection of claim 13 for the reasons set forth below.

Claim 13 depends from claim 1 and is patentable at least for the same reasons as claim 1, in view of the fact that Gigl fails to cure the deficiencies identified above regarding Kihara. Additionally, Gigl discloses at column 10, lines 5-8 and 40-50 that what is used for curing are "beams" which result in a "bullet" shape. This means that the irradiation of the UV light beam is focused on a particular point locally. This is different from the claimed invention which recites an optical building process of exposing a surface of a photocurable resin composition by way of a planar plotting mask. The disclosure of Gigl is directed to beams for local application of energy, rather than the use of a planar plotting mask, as recited in the claimed invention and disclosed in Kihara. Thus, the disclosure of Gigl is not relevant to the disclosure of Kihara and one of ordinary skill in the art would not have combined the two references. Additionally, the discussion above regarding the use of a laser in Manning is applicable to Gigl as well.

In view of the above, claim 13 is distinguishable over the cited art. Reconsideration and withdrawal of the rejection of claim 13 are respectfully solicited.

New claims 15-20 recite curved overlaps or staggered overlaps, which features distinguish over the cited art as explained above regarding claims 12 and 13. Notice of the patentability of claims 15-20 is respectfully solicited.

CONCLUSION

In view of the preceding Amendment and Remarks, it is respectfully submitted that the pending claims are patentably distinct from the prior art of record and in condition for allowance. A Notice of Allowance is respectfully requested.

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